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Perigynia glabrous.

Carex impressa (Wright) Mackenzie.

Specimens examined, all from the herbarium of Mr. K. K. Mackenzie.

INDIANA: Wells Co., C. C. Deam, May 22, 1908. Posey Co., C. C. Deam, May 23, 1911. Porter Co., C. C. Deam, June 17, 1911.

A NEW FOSSIL SELAGINELLA FROM THE LOWER TERTIARY OF MONTANA*

BY F. H. KNOWLTON

The remains of lycopodiaceous plants appear to be very rare in Mesozoic and later horizons, and when one is discovered that shows not only the foliar organs, but the fruiting organs as well in a high degree of perfection, it merits immediate description, and this is the warrant for the present publication.

The beautifully preserved specimens here described as *Selaginella* were obtained during the past summer (1915) by Mr. A. J. Collier, of the United States Geological Survey, in the northeast Montana coal field, at a point a few miles south of the international boundary, in sec. 33, T. 37 N., R. 47 E. The material in which they are preserved is a white, very fine-grained clay especially adapted to retaining even the most delicate plant structures. The plants in association with the *Selaginella* indicate that they probably grew in or very close to the body of water in which they were deposited. These comprise an alga, stems and roots of *Equisetum*, leaves and stems of coarse sedges, a fern (*Onoclea sensibilis fossilis*), a leaf apparently of *Potamogeton*, and a stem bearing whorls of leaves of what is known as *Trapa* ? *microphylla* Lesq. The latter specimen throws much light on the affinity of a plant that has long been imperfectly understood. It will be described and figured on a later occasion.

The *Selaginella* may be known as:

Selaginella Collieri n. sp.

PLATE I, FIGURES 1-6

Stems very slender, weak, evidently erect or suberect, probably from a decumbent base, about 2 centimeters high, pinnate, the branches alternate, close, the lower one or two compound; leaves

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on the stem of two kinds, those of the lower plane alternate, spaced, spreading, apparently rounded at apex; leaves of upper plane small (one-third the length of the others), appressed, oblong, obtuse; branchlets all fertile, apparently square, sporophylls all alike, alternate, close, overlapping, slightly setose-pointed; sporangia large, one in the axil of each bract, circular (now flattened), ornamented with numerous minute, circular elevations.

Types.—U. S. National Museum, Nos. 35,009, 35,010, 35,011.

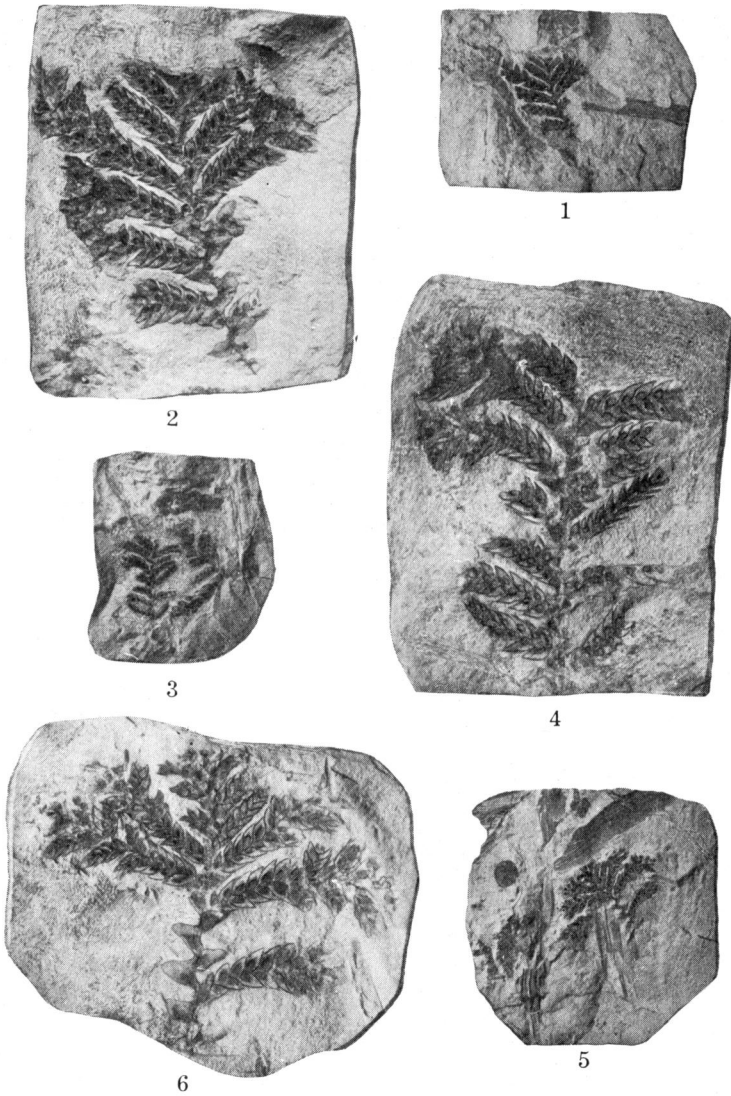
Locality.—Northeast Montana just below international boundary (sec. 33, T. 37 N., R. 47 E.).

Horizon.—Fort Union formation (Eocene), from clay above a large vein of coal and about 40 feet above the base of the formation.

The working out of the probable affinity of *Selaginella Collieri* among the living species is a matter of some difficulty. As is well known, the genus is a vast one, comprising between 500 and 1,000 species, and as many of the species are very close together, and the individual variation often very considerable, an expert knowledge of the genus which the writer cannot lay claim to is really required to stabilize identifications. In the first place it may be pointed out that the fossil species appears to have little or no close relationship with any form now living in the United States or Canada, the nearest species being perhaps *Selaginella apus* (L.) Spring, but this is obviously so remote as to be negligible.

In general *S. Collieri* appears to approach most closely to *S. stenophylla* A. Br. (*S. Lyncnuchus* Tourn., Fil. Mex., p. 148, non Sprieng), and especially its variety *rigidiuscula* Tourn., a native of Mexico. In some features it also resembles *S. didymostachya* (Desv.) Sprieng, and *S. confusa* Sprieng, both natives of Jamaica. It also suggests in the form of its branching *S. guatemalensis* Baker, from Guatemala. However, its small size, very close, densely fertile spikes and spreading leaves serve to distinguish it at once from any of those mentioned above, and it is probable that its real affinities have not been determined. It is hoped, however, that the excellent figures given may ultimately serve to allocate it.

PLATE I.



EXPLANATION OF PLATE I.

- FIG. 1. *Selaginella Collieri* n. sp. Natural size.
FIG. 2. *Selaginella Collieri* n. sp. Four times enlarged.
FIG. 3. *Selaginella Collieri* n. sp. Natural size.
FIG. 4. *Selaginella Collieri* n. sp. Four times enlarged.
FIG. 5. *Selaginella Collieri* n. sp. Natural size.
FIG. 6. *Selaginella Collieri* n. sp. Four times enlarged.

So far as now known this is the first fruiting fossil *Selaginella* to be described. Of the four previously named fossil American species *Selaginella marylandica* Fontaine* is from the Lower Cretaceous (Patapsco formation) of Maryland. It is based on fragmentary remains of dichotomously branching stems of sympodial habit with two laterally attached rows of minute leaves. Concerning its status Berry† says: "While the reference of this form to *Segalinella* is not conclusive it is certainly very suggestive of that genus in its superficial appearance."

Two species were described by Lesquereux from the Montana group at Point of Rocks, Wyoming. Of these *S. falcata* Lesq.‡ is based on small branches with two rows of leaves. Its reference to this genus is questioned even by Lesquereux. The other species, *S. laciniata* Lesq.§ is open to even graver question.

The remaining American species, *S. Berthoudi* Lesq.|| from the Denver formation (Eocene) at Golden, Colorado, has every appearance of having been correctly placed in this genus, although it bears no trace of fruit.

A review of the literature discloses the fact that there are only three¶ fossil extra-American species referred to the genus *Selaginella*, not one of which, however, is in a fruiting condition. These are *S. arctica* Heer, from the Upper Cretaceous of Atanekerdluk, Greenland; *S. dichotoma* Velenovsky, from the Upper Cretaceous of Bohemia; and *S. gallica* Laurent, from the Pliocene of Cantal.

The genera *Selaginites*, which is confined to the Paleozoic, and *Slaginellites*, which is found in the extreme upper Paleozoic and lower Mesozoic, are provided for forms believed to be more or

* Fontaine, W. M., in Ward, L. F., U. S. Geol. Survey Mon. 48, p. 553, Pl. CXV, figs. 9, 10, 1905.

† Berry, E. W., Geol. Survey Maryland, Lower Cretaceous, p. 307, Pl. XLI, figs. 1, 2, 1911.

‡ Lesquereux, Leo, Tertiary Flora, p. 46, Pl. LXI, figs. 12-15, 1878.

§ Op. cit., p. 47, Pl. LXIV, figs. 12, 12a.

|| Op. cit., p. 46, Pl. V, figs. 12, 12a.

¶ The plant from the Jurassic of Yorkshire, England, described by Lindley and Hutton as *Lycopodites falcatus*, was transferred by Brongniart to *Selaginella*, but later authors, notably Seward (Jurassic flora Yorkshire, p. 68), have returned it to *Lycopodites*. Concerning it Seward says: "There is little doubt that *Lycopodites falcatus* should be regarded as a Lycopodiaceous plant more nearly allied to the genus *Selaginella* than to *Lycopodium*."

less clearly related to the modern *Selaginella*, but they need not be further considered in the present connection.

SHORTER NOTES

IS *CARDUUS UNDULATUS* NUTT. FOUND IN COLORADO? When, a number of years ago, I began collecting botanical specimens in Colorado, and later began collecting thistles, I supposed I would find *Carduus undulatus* Nutt. As time went by and I did considerable collecting, and became somewhat acquainted with the many forms of *Carduus* I began to doubt if it is to be found here.

The habitat of *Carduus undulatus* according to Nuttall is, "On the calcareous islands of Lake Huron and on the plains of Upper Louisiana"; and it was said to be 1 to 2 feet high. A part of Dr. Gray's description is, "principal bracts of the involucre . . . comparatively small and narrow, tipped with an evident spreading prickle." I have specimens of a *Carduus* collected by Dr. J. Lunell at Butte, Benson Co., North Dakota, which answer Dr. Gray's description of *Carduus undulatus* Nutt., and I am supposing they represent the true *C. undulatus*.

On the eastern side of the mountains in Colorado there are three species, some of which have been taken for *C. undulatus*. One of these is now *C. Plattensis* Rydb.; and since it has been described and its specific characters pointed out, it is readily recognized and considered to be distinct from *C. undulatus*. Another species which I suppose has been taken for the latter is *C. megacephalus* (Gray) Smyth. This is somewhat variable, especially in size, but it is characterized by the broader involucre bracts, and stouter spines, and I think may be readily recognized. The third member of the group is *C. Floodmani* Rydb. This is quite common on the plains, and in some respects answers better the description of *C. undulatus* than do the other two, since the involucre bracts may be said to be "comparatively narrow, and tipped with an evident spreading prickle."

Those on the western slope belonging to the group of *C. undulatus*, according to Dr. Rydberg's Flora of Colorado, are: *C. Traceyi* Rydb., *C. ob lanceolatus* Rydb., *C. canescens* Nutt., and